

The Effects of Design Strategies for Promoting Students' Self-regulated Learning Skills on Students' Self-Regulation and Achievements in Online Learning Environments

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Abstract

The purpose of this study was to investigate the effects of design strategies for promoting students' self-regulated learning skills on students' self-regulation and achievements. Seven strategies for promoting students' SRL are identified through the literature review and applied into the experimental group: goal setting, self-evaluation, self-monitoring, cognitive strategies, resource management, self-efficacy and volition. Students were assigned into the control and experimental group. Independent samples T-test and semi-structured interview were conducted to analyze the effects of the design strategies. Implications to promote SRL in online learning environment were discussed.

Recently, self-regulated learning (SRL) has emerged as an important issue in educational circles (Boekaerts, 1999; Schunk, 2000; Schunk & Zimmerman, 1998). Self-regulated learning is students' active learning processes in meta-cognition, motivation, and behavior (Zimmerman & Martinez-Pons, 1986). Self-regulated learning skills are critical for students to succeed in learning not only in traditional learning environments, but also in web-based learning environments. This is particularly true in online learning environments, where students basically learn by themselves without face-to-face instruction and immediate help from teachers. In addition, from the perspective of lifelong learning, the needs for E-learning have been increasing. This relatively unfamiliar learning environment can be challenging to students. Therefore, promoting students' SRL skills is something that instructional designers should consider when they design online learning courses.

Zimmerman, Bonner, and Kovach (1996) argued that students' self-regulation can be taught and improved through the students' own efforts. However, promoting students' self-regulation is not an easy task because it requires them to spend a lot of time and energy. In addition, promoting self-regulation is only possible when students experience the benefits of self-regulation (Zimmerman, Bonner & Kovach, 1996).

Many researchers argued that the effective way to improve students' SRL skill is to embed SRL strategies into the context. This is because students do not apply the learned SRL skills into their learning context after they learned self-regulated learning skills. Also, it is important to have students experience (Zimmerman, Bonner & Kovach, 1996) and use the designed SRL skills into their learning. It is true that many students even don't click a designed content or button and ignore many important learning events designed for them (Lim, 2002). Many researchers (Ley & Young, 2001; Zimmerman, Bonner & Kovach, 1996) suggested the following four design principles to promote students' self-regulated learning skills: (1) The SRL activities need to be explicitly delivered to students. (2) Students should have opportunities to utilize learned SRL strategies in real learning situations. (3) Intervention to promote students' SRL skills should be mandatory or strongly structured. (4) Having students successfully experience SRL skills is needed for regular application of SRL skills in their actual learning.

What self-regulated learning skills are critical?

Self-regulated learning strategies consist of cognitive and meta-cognitive activities, resource management activities, and affective activities (Zimmerman and Martinez, 1986; Pintrich, 1999). Corno and Mandinach (1983) viewed self-regulated learning as a deliberate planning and monitoring process and emphasized the importance of cognitive and meta-cognitive activities for self-regulated learning. Cognitive activities refer to rehearsal, elaboration, and organization (Hofer, Yu, and Pintrich, 1998; Yang, 2000). According to Pintrich (1999), rehearsal strategies are recitation of items to be learned, saying the word aloud when students read, and highlighting or underlining the text, elaboration strategies are paraphrasing or summarizing the material, and organizational strategies are selecting the main ideas and outlining the text. Cognitive activities vary depending on the learning domain.

With cognitive activities, meta-cognitive activities are critical for self-regulated learning. If cognitive

activities are specific strategies to accomplish goals, meta-cognitive strategies are monitor and reflection to accomplish goals. Meta-cognitive activities are goal setting, self-monitoring, and self-evaluation. Goal setting refers to deciding on specific learning outcomes (Zimmerman, 1999). Schunk (2000) mentioned two roles of goal setting: a motivator to exert persistent effort over time and the criteria to monitor learning progress. A self-monitoring activity involves comparing goals and current accomplishments with the use of cognitive activities. There are a lot of self-monitoring methods depending on learning context, e.g., narrating behavior in the context, recording frequency counts, measuring duration, time-sampling (dividing observation periods into smaller time periods), and tracing times of behavior occurring (Mace, Belfiore, and Hutchinson, 2001). For an effective self-monitoring, it should regularly, proximately, (Schunk, 2000) and accurately (Mace, Belfiore, and Hutchinson, 2001) occurred. Self-evaluation is a learners' judgment on their performance. Self-monitoring plays a great role in self-evaluation. Based on the results of comparing performance to standards or goals, self-regulated learners decide to whether they will change cognitive strategies, keep going the efforts, or give more efforts. Self-evaluation and self-monitoring occur almost at the same time.

Resource management activities are time and effort management, seeking help from others, seeking information and structuring environment for learning (Pintrich, 1999). Resource management activities can occur differently depending on what prior knowledge about subjects students have and what resources they can use in their context. The activities for resource management are not directly related to cognitive and meta-cognitive activities (Pintrich, 1999) but they are important for academic success (Hofer, Yu, and Pintrich, 1998). Zimmerman and Martinez's research (1986) also indicated that high self-regulated learners did resource management activities more frequently than low self-regulated learners did.

In addition to cognitive, meta-cognitive and resource management activities, students' affective activities play a significant role for their self-regulated learning (Pintrich, 1999; Schunk and Zimmerman, 1998; Shin, 1998). Self-efficacy is students' confidence about their ability to perform a task. Scott (1996) found that high self-efficacy students tend to be confident and motivate themselves to acquire learning while low self-efficacy students tend to less motivate themselves to learn and think that acquiring goals are difficulty. Parajes (2002) found that high self-efficacy students tend to exert more effort than low self-efficacy students do when they meet obstacles in learning. With self-efficacy, volition is also important for self-regulated learning (Garcia, McCann, Turner, and Roska, 1998; Kehr, Bles, and Rosenstiel, 1999; Kuhl, 2000). Volition is students' will power to accomplish certain goals. Garcia, McCann, Turner, and Roska found that volition is strongly related to students' use of cognitive and resource management activities. They argued that volition leads students to goal-directed learning and teaching volitional skills to students will be helpful for them to self-regulated learners.

How self-regulated learning strategies are designed in online learning environment?

Seven self-regulated learning strategies are embedded in the context for learning the Test of Written English (TWE). Learners are required to practice every designed SRL skill in each chapter. When practicing cognitive, meta-cognitive, resource management and affective activities, students are asked to submit the results of the each activity to the instructor.

Meta-cognitive activities: regarding goal setting students were asked to hierarchically set the goals for the course at the beginning of the class. Students set the goals by answering the questions: how this course contributes to getting a job in the future, what goals you have after one year with regards to this course and what goals you have after one month with regards to this course. In addition, they are asked to write down what distracts their learning and devise a plan to overcome the problems. With the regard of self-monitoring, students were asked to self-monitor by checking learning processes box. The questions in the box to check are asking about their goal achievement and using cognitive and resource management strategies. Last, in order to promote students' self-evaluation, writing journal was required of the students.

Cognitive activities: rehearsal, elaboration, organization strategies are suggested as learning clues on the screen with the feedback format whenever it is necessary. Students were asked to practice suggested cognitive strategies and submit the results to the instructor.

Resource management activities: Before starting learning, structuring learning environment questions are given to students with the checkbox format. The questions are about whether they organized a learning environment for the learning. They were also asked to submit their time schedule for this course, e.g., how they schedule this course in their daily lives and how much time they will spend on the course. Last, for effective help, a help desk was operated through the discussion board.

Affective activities: Feedback was given on every student's assignment. When giving feedback,

attribution feedback is given with compliment, e.g., “Your writing is good. If you keep this pace, your writing will be greatly improved”. In addition to attribution feedback, volition encouragement was given with the learning strategy clues on the screen. With structuring learning environment checkbox, questions asking volition were given to remind them of the importance of their volition in learning. The SRL design strategies are summarized in Table 1.

Table 1. *Design strategies to promote self-regulated learning*

SRL strategies	Design strategies
Meta-cognitive activities	Goal setting: students set goals after reading each chapter overview Self-monitoring: students check their learning process at the end of each chapter Self-evaluation: students write a journal about their learning
Cognitive activities	Rehearsal, elaboration, organization: Necessary rehearsal, elaboration, organization are suggested to students as a feedback form depending on content.
Resource management activities	Time management: students are asked to plan their time for learning Help seeking: Online help seeking corner is constructed and encourage students to use it any problem related to learning Structuring learning environment: Feedback is given to students before starting each chapter
Affective activities	Self-efficacy: Progression and attribution feedback are given to encourage them to learn and keep going their learning Volition: students check their volition before they learn each chapter and feedback encouraging volition is given

Course Development

The course consisted of 12 lessons, and the experiment was conducted for a month. Two online learning sites for the control group and the experimental group were respectively developed to verify the effectiveness of design strategies for promoting self-regulation with the use of the book, “*To Be A Master In TWE*” (Min, 2002). The online TWE (Test of Written English) program used in the control group was developed according to the Gagné’s nine events. Another website for the experimental group was developed according to the devised SRL strategies. Both groups’ students commonly should submit their assignments three times per week. In addition to turning in the assignments, the students in the experimental group should obligatorily practice Self-regulated Learning activities and post the results on the online bulletin boards for each class. SRL strategies are visualized in figure 1.

In the figure, the upper menu involves a learning preparation, learning overview, learning goals, learning content, learning evaluation, and learning arrangement. The bottom of the program menu involves a syllabus, room for submitting assignments, notice, and learning aids consisting of button explanations, asking questions, total dictionary, summary of important terminologies, and online English learning sites. In addition, five buttons for SRL, used for setting course goals, planning learning resources, establishing learning goals, following learning strategies, and writing a reflective diary are incorporated on the right side of the screen.

Data gathering

Thirty students in a Korean university volunteered for this research for a month. Most of the students were freshmen. The students are randomly assigned into the experimental group or the control group using random numbers. This is a pre and post test. Students’ self-regulated learning skills and essay levels were measured before and after the treatment.

The Self-Regulated Learning Strategies Questionnaire developed by Yang (2000) was used to measure students’ SRL level. The SRL questionnaire consists of cognitive, meta-cognitive, motivational and behavior strategies. The number of item is 84. It uses a self-reported five-Likert scale.

An essay topic randomly chosen from the ETS TWE topics is used to measure students’ prior knowledge and achievements. These were measured by providing students a topic and letting them write an essay about the topic. The criteria used in ETS were also used in rating students’ prior knowledge and achievements. ETS uses 0 – 6 scale points to evaluate students’ essay where 6 is the best score.

Research Questions

Students studying in learning environments, which are designed to forcefully encourage the practice of SRL skills, will show a higher self-regulation than others studying in normal learning environments, which don't support SRL activities.

Students studying in learning environments, which are designed to forcefully encourage the practice of SRL skills, will show a higher achievement than others studying in normal learning environments, which don't support SRL activities.

Results

Independent samples T test for group comparison and semi-structured interviews were used to analyze the data. Pre-test results showed that there is no significant difference in SRL between two groups. Also, there was no significant difference in TWE level between two groups. The mean scores of each group was the same with each other, $M = 1.067$.

SRL Post-test indicated that there was no significant difference between groups. Also, there was no significant different in SRL strategies between groups. Experimental group's sum of SRL scores (276.85) were slightly higher than those of control group (274.07). However, it was not significantly different. This means that the treatment having students practice SRL skill was not effective.

Table 2. *SRL level comparison between experimental and control group.*

	Control group		Experimental group	
	M	SD	M	SD
Cognitive	58.73	6.11	59.47	6.19
Meta-cognitive	36.20	4.92	35.27	4.83
Motivational	87.47	14.41	86.27	10.43
Behavioral	91.67	12.93	95.87	7.97
SRL	274.07	30.44	276.87	20.62

Regarding the students' TWE levels, there was slight difference between the two groups. The mean score of the experimental group ($M = 3.07$) was slightly higher than mean of control group ($M = 2.97$). However, the difference was not significant. The one important thing is that TWE scores were significantly improved during the one month in both groups, $t(29) = -20.761$, $p = .00$ (two-tailed). This means that the online course was effective to improve students' performance.

In order to identify the reasons why the treatment was not effective, semi-structured interviews with the experimental group students were conducted. The interview data revealed that students didn't know how to effectively practice the intended SRL skills and they didn't know the necessity of practicing SRL skills. Many students in the experimental group felt that practicing SRL skills was another assignment which made them annoying. Many students reported that the designed SRL practices were demanding. In the experimental group, students were required to submit every result of SRL practices three times a week. This fact made them less motivated in learning TWE. Last, they felt that individualized SRL practice were necessary. Some of them were already good at cognitive activities or time planning. They did not want to follow practices, which were different from their own ways. The interview data gave clues why the treatment was not effective to promote their SRL skills.

Discussion

The purpose of this research was to investigate the design strategies for promoting SRL skills on students' SRL skills and performance. The research results imply three things to consider when designing SRL practice and training SRL skills in online learning environments.

First, college level students' self-regulated learning skills are not something to be improved in short time periods just by forcefully having them practice activities. Interview results showed that students felt a lot of burden because of the mandatory participation in every designed self-regulated learning activity. This led some students' motivation going down and being hesitant to use self-regulated learning activities.

Second, exposing students to practice self-regulated learning skills is not enough to promote their self-

regulated learning. They need continuous interactions with peers or with instructors about their progress. Interview results showed that many students was not able to fully understand the purpose of self-regulated learning and why they were doing the activities. The interactions with others will remind them to think continuously about their activities and progresses. This will lead them to self-regulated learner and to apply the acquired skills to other contexts.

Third, autonomy and responsibility should be given to students to self-regulate their own learning while they practice designed practices. The online program was intended to give as many opportunities for students to practice self-regulated learning skills and feel the benefits of them. That's why it demanded students' mandatory participation in the SRL. However, it did not consider how students' self-regulated learning skills are different. For example, some students are good at resource managements while they are not good at cognitive activities. Some students are good at meta-cognitive activities while they are not good at resource managements. By allowing some extend autonomy and responsibilities they will focus on their weakness of self-regulated learning skills.

Figure 1. Self-regulated learning design strategies in the online learning environment



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